M ath P ractice Section 1: E asy D ifficult

M ath P ractice Section:
E asy 20 Q uestions
35 M inutes

For questions in the Q uantitative C om parison form at ("Q uantity A " and "Q uantity B " given),the answ er choices are alw ays as follow s:

(A) Q uantity A is greater.
(B) Q uantity B is greater.
(C) The tw o quantities are equal.
(D) The relationship cannot be determ ined from the inform ation given.

For questions follow ed by a num eric entry box ⬚,you are to enter your ow n answ er in the box.For questions follow ed by fraction-style num eric entry boxes ⬚,you are to enter your answ er in the form of a fraction.Y ou are not required to reduce fractions.For exam ple,if the answ er is 1/4,you m ay enter 25/100 or any equivalent fraction.

A ll num bers used are real num bers.A ll figures are assum ed to lie in a plane unless otherw ise indicated.G eom etric figures are not necessarily draw n to scale.Y ou should assum e,how ever,that lines that appear to be straight are actually straight,points on a line are in the order show n,and all geom etric objects are in the relative positions show n.C oordinate system s,such as *xy*-planes and num ber lines,as w ell as graphical data presentations such as bar charts,circle graphs,and line graphs, *are* draw n to scale.A sym bol that appears m ore than once in a question has the sam e m eaning throughout the question.

1.

$x, y,$ and z are consecutive integers such that $x < y < z$
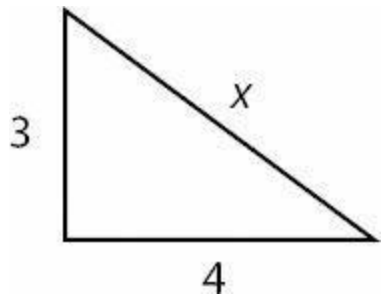
Q uantity A	Q uantity B
y	$\dfrac{x + z}{2}$

2.

Q uantity A	Q uantity B
$(-3)^4$	$(-3)^{-3}$

3.

Q uantity A	**Q uantity B**
x	5

4.

Q uantity A	**Q uantity B**
$y^7 \times y^8 \times y^{-6}$	$3y^9$

5.

$$xy > 0 \text{ and } yz < 0$$

Q uantity A	**Q uantity B**
xz	0

6.In 2011,it cost Tam m y $1.30 to m anufacture each copy of her m agazine,w hich she sold for $2.30.In 2012,it cost Tam m y $1.50 to m anufacture each copy of the sam e m agazine,w hich she sold for $3.00.

Q uantity A	**Q uantity B**
The percent by w hich Tam m y's profit per copy of the m agazine changed from 2011 to 2012	$33\frac{1}{3}\%$

7.List X : 4,7,9,11,24,32

List Y (not show n) consists of 6 unique num bers,each com puted from the corresponding term in List X by dividing the num ber in List X by 2,then adding 5 to the result.

Q uantity A	**Q uantity B**
The range of List Y	6 less than the greatest num ber in List Y

8.W hich of the follow ing represents the length of the diagonal d of a square w ith area a?
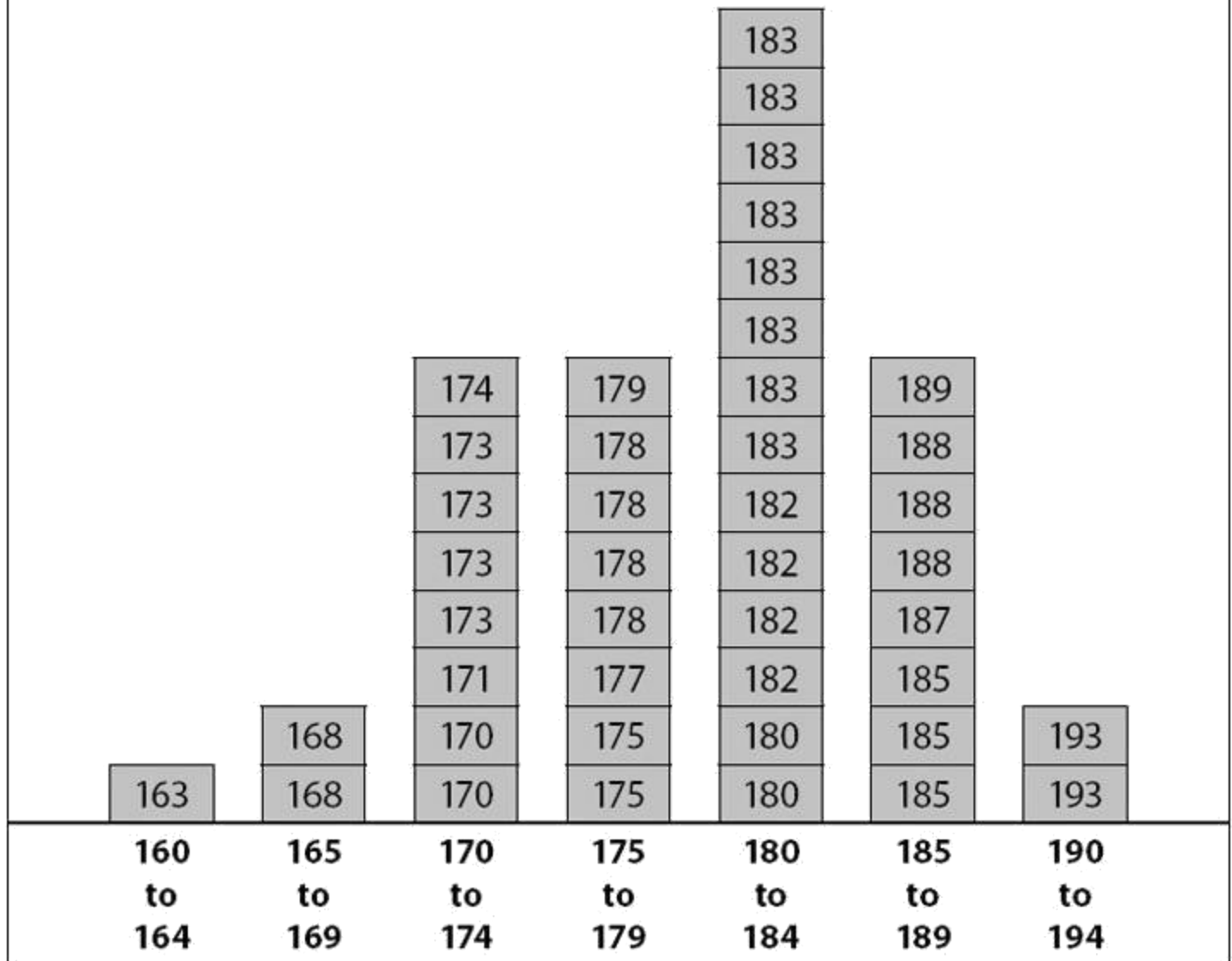
(A) $d = a^2$

(B) $d = \sqrt{2a}$

(C) $d = 2\sqrt{a}$

(D) $d = a\sqrt{2}$

(E) $d = a\sqrt{3}$

9. In an apartm ent com plex,60 percent of the apartm ents contain at least one television,and 20 percent of these apartm ents are equipped w ith cable.If every apartm ent that is equipped w ith cable contains at least one television,w hat percent of the apartm ents in the com plex are not equipped w ith cable?

(A) 8%

(B) 12%

(C) 16%

(D) 88%

(E) 92%

Q uestions 10–12 are based on the follow ing chart.

Heights of 43 Presidents of the United States of America (in cm)

160 to 164	165 to 169	170 to 174	175 to 179	180 to 184	185 to 189	190 to 194
				183		
				183		
				183		
				183		
				183		
				183		
		174	179	183	189	
		173	178	183	188	
		173	178	182	188	
		173	178	182	188	
		173	178	182	187	
		171	177	182	185	
	168	170	175	180	185	193
163	168	170	175	180	185	193

10. What is the range of heights of the 43 U.S. Presidents in the chart?

(A) 30 cm
(B) 34 cm
(C) 35 cm
(D) 163 cm
(E) 178 cm

11. What is the median height of the 43 U.S. Presidents in the chart, in centimeters?

(A) 175
(B) 177
(C) 178
(D) 180
(E) 182

12. Approximately what percent of U.S. Presidents have been 185 cm or taller?

(A) 10%
(B) 23%
(C) 29%
(D) 43%
(E) 50%

13.If $m+5 < \dfrac{3}{2}$,which of the follow ing scould be the value of m ?

(A) $-\dfrac{15}{4}$

(B) $-\dfrac{7}{2}$

(C) -2
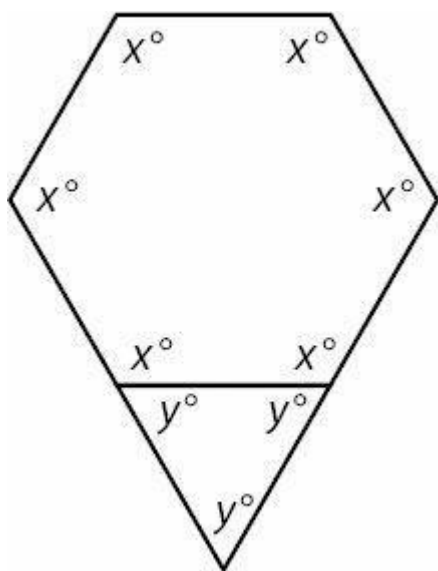
(D) $\dfrac{7}{2}$

(E) 2

14.List M consists of the num bers 10,20,30,40,50.

W hich of the follow ing lists of num bers have an average (arithm etic m ean) that is equal to the average of the num bers in List M ?

Indicate all such lists.

☐ 0,30,60
☐ 10,20,30,35,50
☐ 10,22,30,38,50
☐ 0,0,0,0,150

15.

W hat is the value of *xy*?

[   ]

16.

B uying H abits O f C ustom ers B uying Toothpaste X A t C han's G rocery Store

D iscount Type	M anufacturers' C oupon	Store C oupon	N o C oupon
Percent of C ustom ers	54%	43%	x%

The table above sum m arizes all possible discount types for custom ers buying Toothpaste X at a certain grocery store.N o one used both types of coupon.If a person is selected random ly from am ong the custom ers buying Toothpaste X at C han's G rocery Store,w hat is the probability that this custom er did not use a coupon?

(A) 0.003
(B) 0.03
(C) 0.3
(D) 0.33
(E) 3.3

17.C om pany A can pave 500 feet of sidew alk in 6 hours,and C om pany B can pave 1,000 feet of sidew alk in 8 hours. A t these rates,how m any m ore *yards* of sidew alk can C om pany B pave in 9 hours than C om pany A can pave in 9 hours? (3 feet = 1 yard)

(A) 125
(B) 166
(C) 333
(D) 375
(E) 500

18.If the three sides of an equilateral triangle are equal to 4*x*,6*y*,and 24,respectively,w hat is the ratio of *x* to *y*?
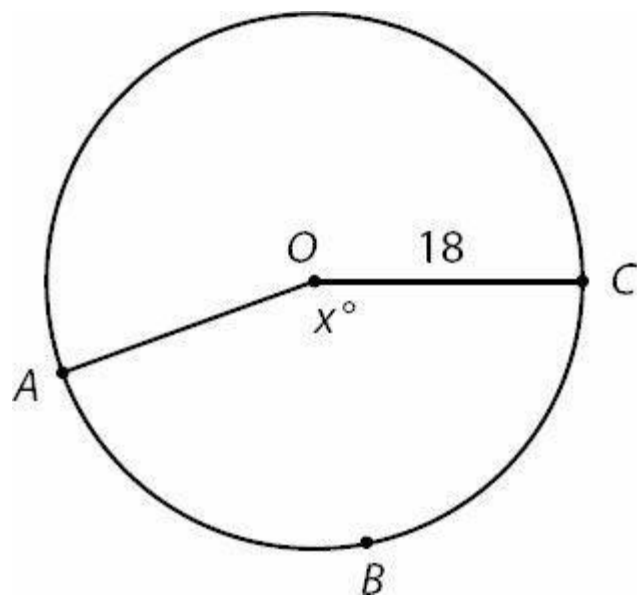
G ive your answ er as a fraction.

$$\frac{\boxed{}}{\boxed{}}$$

19.If the ratio of undergraduate students to graduate students is 7 to 4 and the ratio of graduate students to professors is 2 to 1,w hich could be the total num ber of undergraduate students,graduate students,and professors?

Indicate all such num bers.

☐ 520

20.

W hat is the perim eter of sector *ABC O* if *x* = 160?

(A) 18 + 8π
(B) 18 + 16π
(C) 36 + 8π
(D) 36 + 16π
(E) 36 + 24π

A nsw ers to M ath P ractice Section 1

1.(C). The average of three consecutive integers is alw ays equal to the m iddle value,and is alw ays equal to the average of the sm allest and largest term s.Since Q uantity B represents the average of the sm allest and largest term s,it is equal to the m iddle term y.

A lternatively,pick num bers.If x,y,and z are 1,2,and 3,the Q uantity A = 2 and Q uantity $$B = \frac{1+3}{2} = 2$$ quantities are equal.A ny other exam ple of three consecutive num bers w ill also yield equal quantities.

2.(A). In Q uantity A ,$(-3)^4$ = (-3)(-3)(-3)(-3) = 81.In Q uantity B , $$(-3)^{-3} = \frac{1}{(-3)^3} = \frac{1}{-27}$$.Q uantity A is greater. N ote that you can stop calculating as soon as you realize that one quantity is positive and one is negative.The negative base in both quantities suggests that you should check w hether the exponents are odd or even.Even exponents "hide the sign" of the base,so a negative base to a even exponent is positive.O n the other hand,a negative base to an odd exponent rem ains negative (even if the exponent is a *negative* odd).

3.(D). If this w ere a right triangle,the Pythagorean theorem w ould indicate that

$$3^2 + 4^2 = x^2$$
$$9 + 16 = x^2$$
$$25 = x^2$$
$$5 = x$$

H ow ever,the triangle is not know n to be right (the Pythagorean theorem only applies to right triangles),as none of the angles are labeled.The Third Side R ule,w hich applies to all triangles regardless of angle m easures,states that the third side of any triangle m ust be greater than the difference betw een the other tw o sides and less than the sum of the other tw o sides.So,x m ust be greater than 4 - 3 = 1 and less than 4 + 3 = 7.x could be less than,greater than,or equal to 5,so it cannot be determ ined w hich quantity is greater.

4.(D). Since the term s in Q uantity A have the sam e base and are m ultiplied together,sim plify by adding the exponents:

$$y^7 \times y^8 \times y^{-6} = y^9$$

W hile y^9 m ay *seem* sm aller than $3y^9$,this is only true if y is positive.If y = 0,the tw o quantities are equal.If y is negative,so is y^9,and $3y^9$ is m ore negative than y^9.Thus,it cannot be determ ined w hich quantity is greater.

5.(B). Since $xy > 0$,x and y have the sam e sign.Since $yz < 0$,y and z have opposite signs.Therefore,x and z have opposite signs.If x and z have opposite signs,their product is negative,w hich is less than 0.Q uantity B is greater.

6.(A). In order to calculate the percent change in profit from 2011 to 2012,first calculate the profits in each year

based on the form ula:

Profit = R evenues - C osts

Therefore,

Profit per each copy of the m agazine in 2011 = $2.30 - $1.30 = $1.00
Profit per each copy of the m agazine in 2012 = $3.00 - $1.50 = $1.50

To find the percent increase,use the percent change form ula:

$$\text{Percent Change} = \left(\frac{Difference}{Original} \times 100 \right)\%$$

$$\text{Percent Change} = \left(\frac{0.50}{1.00} \times 100 \right)\% = 50\%$$

B e careful not to put the 2012 profit in the denom inator.M istakenly doing so w ould lead you to pick (C) erroneously. The "O riginal" profit is that for 2011.

Q uantity A is greater.

7.**(B)**.Since the term s in List Y are "each com puted from the corresponding term in List X by dividing the num ber in List X by 2,then adding 5 to the result," List Y consists of 7,8.5,9.5,10.5,17,21.

Q uantity A : The range is 21 - 7 = 14.
Q uantity B : 6 less than the greatest num ber in Set Y = 21 - 6 = 15.

Q uantity B is greater.

8.**(B)**.A square w ith area a has sides of $\sqrt{a}$.U se the Pythagorean theorem w ith $\sqrt{a}$ for each leg and d for the hypotenuse:

$$(\sqrt{a})^2 + (\sqrt{a})^2 = d^2$$
$$a + a = d^2$$
$$2a = d^2$$
$$\sqrt{2a} = d$$

This is a m atch w ith choice (B).A lternatively,plug in num bers.If a square has side length 4,the area a equals 16 and the diagonal w ould be:

$$4^2 + 4^2 = d^2$$
$$32 = d^2$$
$$\sqrt{32} = d$$

Plug a = 16 into each choice to see w hich yields $d = \sqrt{32}$.O nly choice (B) w orks.

9.**(D).**The easiest w ay to solve this problem is to choose a sm art num ber for the total num ber of apartm ents in the apartm ent com plex.A s this is a percents problem ,choose a total of 100 apartm ents.Since 60% of these apartm ents have a television,60 apartm ents contain a television (or m ore than one television— it doesn't m atter how m any— only television at all vs.no television m atters) and 40 apartm ents do not contain a television.

B ecause 20% of the apartm ents that contain a television are equipped w ith cable,20% of 60 = 12 apartm ents have both television and cable.B y extension,60 - 12 = 48 apartm ents have television,but are not equipped w ith cable.

"Every apartm ent that is equipped w ith cable contains at least one television" m eans that none of the 40 apartm ents w ithout a television are equipped w ith cable.Thus,40 apartm ents have neither a television nor cable.

In sum m ary:

N o TV ,no cable = 40
TV ,no cable = 48
N o TV ,cable = 0
TV and cable = 12

O nly 12 apartm ents are equipped w ith cable,m eaning 100 - 12 = 88 are not.A lternatively,48 + 40 = 88 apartm ents are not equipped w ith cable.

Since 88 out of 100 apartm ents are not equipped w ith cable,the answ er is 88% .

A lternatively,you can solve this problem by assigning the variable x to the total num ber of apartm ents in the apartm ent com plex.Follow ing the steps from above,0.6x apartm ents contain a television and (0.2)(0.6x) = 0.12x apartm ents are equipped w ith cable.From here,x - 0.12x = 0.88x apartm ents,or 88% of the apartm ents in the com plex,do not have cable.

10.**(A).**The shortest U S President w as 163 centim eters tall,and the tallest w as 193 centim eters tall.The range is the difference betw een the highest and low est value,and 193 cm - 163 cm = 30 cm .

11.**(E).**The m edian is the m iddle value if all the data points are arranged from least to greatest.W ith 43 data points, the m edian is the 22nd data point,because there are 21 data points that are less than or equal,and 21 data points that are greater than or equal,this m edian.C ounting up from the least value (or dow n from the greatest value),the 22nd data point is 182 cm .

12.**(B).**From the chart,10 U .S.Presidents have been 185 cm or taller,out of a total of 43.A s a percent,this is

$$\left(\frac{10}{43} \times 100 \right)\%$$

,or approxim ately 23% .

13.**(A).**Solve the inequality:

$$m+5<\frac{3}{2}$$

$$m<\frac{3}{2}-5$$

$$m<\frac{3}{2}-\frac{10}{2}$$

$$m<-\frac{7}{2}$$

(A) is the only answ er choice that is less than $-\frac{7}{2}$.If needed,plug each answ er choice into the calculator and com pare decim al values to -3.5.

14.**I,III,and IV only.**C ertainly,you could average the list 10,20,30,40,50 (the average is 30) and then average the lists in all the answ er choices to see w hich also average to 30.H ow ever,you cannot afford to w aste any tim e on the G R E .
Instead,note that the average of an evenly-spaced set is equal to the m edian.Thus,the average of 10,20,30,40,50 is the m edian,or m iddle term ,30.In Statem ent I,the list 0,30,60 is also evenly-spaced,so the average is 30.

In Statem ent II,the list 10,20,30,35,50 is the sam e as the original list (10,20,30,40,50) except for one num ber — the 40 has been changed to 35.Thus,the averages cannot be the sam e.

In Statem ent III,the list 10,22,30,28,50 is the sam e as the original list (10,20,30,40,50),but w ith 2 taken aw ay from the fourth num ber and added to the second num ber.Since the sum didn't change,the average doesn't either.

In Statem ent IV ,the average is sim ply the sum divided by the num ber of item s,or 150/5 = 30.

15.**7,200.**Since every angle in the hexagon is labeled $x°$,the hexagon is equiangular.To find the sum of the degree m easures in a polygon,use the form ula $(n - 2)(180)$,w here n is the num ber of sides.Since $n = 6$,(6 - 2)(180) = 720, and the sum of the degrees in the hexagon is 720.Thus,$6x = 720$ and $x = 120$.

Since the triangle is equiangular,$3y = 180$ and $y = 60$.

Thus,the value of $xy = 120 \times 60 = 7,200$.

16.**(B).**A dd 54% + 43% = 97% to get the percent of custom ers w ho used a coupon.O nly 100% - 97% = 3% of custom ers did not use a coupon.Thus,for a person selected random ly from am ong the custom ers buying Toothpaste X at C han's G rocery Store,there is a 3% ,or 0.03,probability that he or she did not use a coupon.

17.**(A).**C om pany A can pave 500 feet of sidew alk in 6 hours,and thus $\frac{500}{6}$ feet per hour.In 9 hours,C om pany A can pave $\frac{500}{6} \times 9 = 750$ feet of sidew alk.

C om pany B can pave 1,000 feet of sidew alk in 8 hours,and thus $\frac{1000}{8} = 125$ feet per hour.In 9 hours,C om pany B can pave 125 × 9 = 1,125 feet of sidew alk.

Thus,in 9 hours,C om pany B can pave 1,125 - 750 = 375 feet of sidew alk m ore than C om pany A .Since 3 feet = 1 yard,divide by 3 to get the answ er in the correct units: 375 feet divided by 3 feet per yard = 125 yards.

18.$\frac{3}{2}$ **(or any equivalent fraction).**Since the sides of an equilateral triangle are all equal,$4x = 6y = 24$.W ith a three part equation,you can equate any tw o parts you w ish.

For instance:

$4x = 24$
$x = 6$
$6y = 24$
$y = 4$

Thus,the ratio of x to y is 6 to 4,w hich reduces to 3 to 2.O n the G R E,you do not need to reduce the answ ers to fraction num eric entry questions.

19.**I and III only.**If the ratio of undergraduate students to graduate students is 7 to 4 and the ratio of graduate students to professors is 2 to 1:

U ndergraduate	G raduate	P rofessors
7	4	
	2	1

Equate the ratios by m aking the tw o num bers under "G raduate" equal.To do this,double the second ratio.(If you change one num ber in the ratio 2 : 1,you m ust perform the sam e operation to the other num ber in that ratio.)

U ndergraduate	G raduate	P rofessors
7	4	
	4	2

N ow ,collapse the ratios onto one line:

U ndergraduate	G raduate	P rofessors
7	4	2

The ratio is 7 to 4 to 2.Since 7 + 4 + 2 = 13 and num bers of people m ust be integers,the total num ber of people m ust be a m ultiple of 13.O nly 520 and 2,600 qualify.

20.**(D).**If x = 160,then the sector is $\dfrac{160}{360} = \dfrac{4}{9}$ of the circle.Thus,arc ABC is $\dfrac{4}{9}$ of the circum ference.Since the circum ference = $2\pi r = 2\pi(18) = 36\pi$,take $\dfrac{4}{9}(36\pi) = 16\pi$

Thus,the perim eter of the sector is equal to tw o radii plus 16π,or $36 + 16\pi$.